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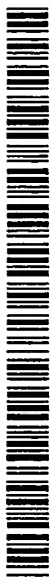
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(54) Title: **MULTI-LAYER SLAB PRODUCT MADE OF STONE GRANULATES AND RELATIVE MANUFACTURING PROCESS**

(57) Abstract: The invention concerns a product and the relative manufacturing process, said product, including at least a precast support (2) of expanded material and at least a layer (3) of agglomerated stone material in form of granulates bound by a binding phase, over at least one surface of said expanded support (2). According to suitability, the product (1) is made by a sandwich structure with an intermediate layer of expanded material and two surface coatings of stone material. The product (1) can also have a complex or modular shape, from which it is possible to cut and eventually to work finished pieces of predetermined dimensions. The main advantage of the invention consists in obtaining a finished product (1, 10, 100) lighter than a product made of agglomerated stones homogeneous in the thickness.

In this case the resin curing is obtained by a thermal reaction, warming the product, which hardens in a few minutes.

The manufacturing process is more convenient than the block molding technology and the production cycles are advantaged. Due to the fact that the
5 sawing phase is not necessary, the slab, after the hardening phase, can be immediately supplied to the final working phase.

The resulting products show mechanical properties which make them particularly suitable, after the necessary working phases, for the manufacture of floorings, internal walling and external cladding of residential and public buildings,
10 and of furniture components.

When a synthetic resin is used as binder, one of the main advantages is that the hardening phase requires very short time and the mechanical properties of the product are better than those of the corresponding cement bound products.

The disadvantage connected with the use of a synthetic resin is the high price of the resin, so that, also if it is used in a relatively small amount, the cost of a resin
15 bound product is always high. On the contrary, when a cement binder is used, the main problem, in an industrial production, is connected with the long time required by the set and the subsequent hardening. Moreover, the final product is heavy, since high thickness must be used due to the poor mechanical resistance when compared
20 to the resin bound products, mainly in the phase of installation as outdoor wall finishes.

Besides to these general aspect problems, there are other problems specifically connected to specific applications.

In the case of products for the manufacturing of components for furniture, for
25 example, the high weight of the element represents a disadvantage both from the commercial, for the elevated transport cost, and from the performance point of view, for the difficulty of the installation.

In fact, a typical formulation for the production of agglomerated stones using

intermediate layer.

It has been experimentally shown that an agglomerate of expanded clay bound by polyester resin can reach a specific weight lower than 1 kg/dm^3 .

Therefore, a laminated composite product, with a sandwich structure according to the invention, 1 m^2 of a size and 3 cm in thickness, as in the example above described, containing an upper surface layer and a lower surface layer, both of them of 0.5 cm of agglomerated marble, and an intermediate layer of 2 cm of agglomerated expanded clay, will have a total weight of 45.7 kg.

Such a product results therefore noticeably lighter than a product with the same dimensions, made of agglomerated stone but homogeneous in thickness.

The product in multi-layer composite slabs, according to the invention, can also be realised with at least a perimetral edge, suitably shaped, in stone material.

Advantageously, the product according to the invention can also be manufactured in form of complex element comprising a plurality of modular elements with a sandwich structure, connected each other by layers of stone chips material, in order that the single moduli can be, when necessary, separated one from the other by cutting and optionally finished to obtain the wished edge shape.

Further characteristics of the invention will be evident from the following description, referred to embodiments given by way of an example, shown in the attached figures, where:

- fig.1 is an axonometric schematic view of a product with a sandwich structure according to the invention;
- fig.2 is a view in partial section of the product shown in fig.1, but with a lateral edge in stone chip material;
- fig.3 is a view in axonometry of a complex or modular product, from which it is possible, for example, to obtain by cutting and subsequent finishing, single or edged elements, such as that shown in fig.2.

Fig.1 shows a product (1) according to the invention, having a sandwich

The advantages are evident from the above description, the scope of the invention being determined by the content of the annexed claims.

EXAMPLE

An example of manufacturing process of a product according to the invention typically includes the following phases:

- molding by vibro-compression under vacuum of a block made of expanded clay chips, of a selected grain size, bound by the minimum requested amount of polyester resin;
- hardening of the block via a chemical reaction by curing at room temperature;
- sawing of the block in slabs of predetermined thickness and subsequent slab surface gauging;
- perimetral finishing of the agglomerated slabs in expanded clay for working them, if requested, to the wished shape;
- mixing of a mixture of stone chips in the selected grain size, powder and binder in the typical proportions required for the manufacturing of an agglomerate (the stone chips can be suitable made of marble, granite, quartz, or other inert materials);
- distribution of the required amount of mixture on a molding belt, to mold the first lower layer of the composite;
- positioning, according to convenience, of expanded clay over this first layer of the slab;
- distribution on the slab of expanded clay of a further amount of mixture, suitable to make the upper layer of the composite;
- molding by vibro-compression under vacuum, in a single step, of the layers of the prepared composite;
- hardening of the mixture via thermal reaction;
- surface and perimetral finishing of the mold product, as desired.

- positioning of at least one precast support (2) made of expanded material agglomerate in a mold or on a molding belt;
 - distribution of a stone material agglomerate (3) on at least one surface of said support (2), together with a binding phase;
- 5 • vibro-compression under vacuum of said stone material agglomerate (3) and of said precast support (2).
9. A process according to claim 8, wherein said at least one precast support (2) is previously obtained by vibro-compression under vacuum from expanded clay granules bound with polyester resin.
- 10 10. Use of a product of claims 1-7 for the manufacture of floorings, internal walling and external cladding of residential and public buildings, and of furniture components.

INTERNATIONAL SEARCH REPORT

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 136 862 A (CERIC) 29 December 1972 (1972-12-29) claims 1,6-10 page 2, line 6 - line 14 page 3, line 7 - line 25 page 4, line 15 - line 26 ---	1,10
A	US 4 348 452 A (PAOLO PECCENINI ET AL) 7 September 1982 (1982-09-07) claim 1 column 1, line 15 - line 27 column 4, line 34 - line 40 ---	1-10
A	GB 2 224 283 A (DALLA VALLE ROBERTO) 2 May 1990 (1990-05-02) claims 1,3,15,16 example 1 --- -/--	1-10

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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